TRAINING FOR THE FUTURE CNS/ATM

Joseph M. Del Balzo
President, JDA Aviation Technology Solutions
1201 Connecticut Ave. N.W., Suite 250
Washington, D.C. 20036

ABSTRACT

Preparing for the transition to a space-based Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) system will be a very challenging prospect for institutions that provide maintenance and controller training. Financial and personnel resources are declining in most countries and training requirements are increasing, an intolerable situation if you are responsible for resource administration.

The advent of the Global Positioning System (GPS) or Global Navigation Satellite System (GNSS) brings with it new concepts in ATM that will task the training community. The maintenance technicians workload may actually be reduced as there is less equipment to contend with than with the conventional ground based systems. However, for the air traffic controller, it is a different story. Space based systems will generate new operational procedures and that process will drive new training requirements especially for air traffic controllers. The controller must not only manage traffic based on ground systems such as VOR and radar but also accommodate new satellite technology ATM concepts such as "Free Flight".

This paper introduces some of the challenges for future training programs and suggests "out of the box" approaches to cope with the new training requirements.

INTRODUCTION

Civil Aviation Authorities (CAAs) around the world are faced with having to modernize and build new air traffic management system capabilities to cope with the burgeoning growth in air commerce. The FAA released projections for air travel increasing anywhere from 4% in the US to 7% in other parts of the world such as Asia and the Pacific[1]. The issues may be different in each country but all CAA's share the same challenge – how to deal with the future operational needs, particularly maintenance and controller training. Aviation growth, aging equipment, political issues, financing, human resources, safety, security and training are but a few of the common issues each CAA will face as we move into the next century. Compounding these challenges is the introduction of new technologies. Automatic Dependent Surveillance, both Addressable (ADS-A) and Broadcast (ADS-B) have the potential to revolutionize air traffic management. Data link is another communications aid that will be coming along early in the next century. Along with the new technology will be new tasks and challenges for the training community. CAAs will not only have to continue providing training for conventional systems but will have to introduce totally new traffic management procedures for using GPS, ADS and data link. The pay back, however, will be huge in terms of more fuel-efficient routings, greater system capacity, reduced air traffic separations and improved safety. Emerging technologies will bring about changes in procedures, training requirements and airspace management. New

automation tools are in work and, in conjunction with the new ATM technologies, will place even greater burdens on the training infrastructure. We will need new controller and maintenance training concepts and approaches to personnel resource management.

To put a discussion of training in proper perspective, we need to first discuss what is happening more and more in civil aviation administrations.

How the future aviation infrastructure is managed is a very complex issue that will have bearing on training programs. Establishing in house or outsourced training capability may be directly tied to how the CAA itself is structured. There is no one single management solution that fits all situations. This subject continues to be hotly debated in the US and deservedly so because making the wrong decision can have far-reaching and serious consequences. Several countries such as New Zealand, Switzerland, Czech Republic, Germany, Latvia, Ukraine, South Africa, Canada, Ireland, Portugal, Austria, Australia and the United Kingdom have either privatized, corporatized or separated their ATC functions from the government oversight organization. [2]

The new management is either 100% government owned as in South Africa and New-Zealand, or semi-private companies as in Switzerland (government has 71% stock interest only).[3] In most of these cases change in management oversight is working with measured success. The paradigm that is emerging is "the less the government is involved and more autonomous the organization, the more likely it is to succeed". However, whether any of these management structures are right for the US is the center of debate in Washington, DC.

DISCUSSION

The challenge is clear, CAAs must look and plan ahead. Strategic plans must be developed with clearly established training goals and objectives. The plan must be a "living" document with alternatives to fit every contingency from changes in funding to diminished personnel resources.

Model training plans do exist but there are no "cookie cutter" solutions, but any plan at a minimum should include the following: *alternative training concepts*,, *training recruiting strategies*; *facilities and management structure*s, *training plan* and of course, *funding strategies*.

Lets explore these elements.

Alternative Training Concepts

Alternative training concepts is one area where "out of the box" thinking must be exercised. For example, outsourced training versus in house capability or a combination of both methods needs to be examined. The training plan should address all viable alternatives particularly in view of getting prepared for the emerging technologies.

CAA administrations with generic training capabilities such as the FAA are now offering "training for sale". This concept is perhaps an indication of what is to come in the future. Countries without staff and facilities can take advantage of this opportunity, and even those with capability may have a need for advanced training with the new technologies. These type of approaches to training need to be fully explored as training plan options.

Training Recruiting Strategies

The satellite based ATC systems being designed around the world will place new demands for talented training resources. Skilled human resources will be at a premium and training could suffer if managers are not aware of what's ahead. For example, the Wide Area Augmentation System will enable direct route navigation using GPS not being tied to ground VOR systems. Until the entire ATC system has transitioned to a space-based system, the air traffic controller will be responsible for issuing clearances to aircraft using both conventional ground and space-based systems. New rules, procedures and alternatives such as special use airspace requirements may be required.
Finding the resources to train controllers and maintenance technicians for the dual system environment will be difficult at best and training administrators should start preparing for this situation now.

Facilities and Management

How a CAA plans to transition from the conventional ground based to the space-based systems the central issue, particularly if the current ground based infrastructure is aging. Timing the implementation of new capabilities to replace the aging infrastructure is critical to avoid unexpected expenses of having to replace old equipment on an interim basis until the new technology is ready for deployment.

The transition will further burden the human resource and training institutions to provide training for both ground and space based systems simultaneously. With only a few resources available, and most in decline, maintaining fully staffed and equipped training facilities will tax even the most affluent of CAAs. New training equipment will be needed and instructors with satellite technology backgrounds will be required. Where to find these unique resources will be a great challenge. Academic institutions will have to get involved with specialized courses in satellite technology. Private corporations will need to establish new equipment syllabuses and create technical resource pools to support the training academies. While most of the attention is given to the technology, CAAs are going to have to concern themselves with developing adequate support infrastructures as well.

Developing a Training Plan

Developing a training plan is an essential step that must address all areas from resource development to implementation. It must lay out a strategy for coping with the future related technology while at the same time, providing the requirements for maintaining the conventional ground based system training requirements - not a simple task. The plan must have the support of the controller and technicians unions, the administration and the aviation industry.
It must be adaptable to changes in requirements, equipment and airspace management. Training programs must take advantage of new teaching methods and tools such as simulation and modeling, computer based instruction and interactive video teleconferencing training tailored to both domestic and international requirements. Developing a robust plan is the most important element to ensure structure and discipline to the entire training process. It will also support budget requests.

Funding Resources

Securing the funding resources for maintenance and training programs should be a major part of the overall strategic plan. There are several ways to raise capital ranging from classic bank loans and grants to fees for services. The FAA is already providing controller and maintenance training on a reimbursable or "fee for service" basis. Other countries such as South Africa have similar

service fee arrangements. The establishment of a user fee system for services including training could also act as loan collateral.

Each capital resource option has its own merits but the important point is to identify training requirements early enough to be included in the CAA budget. Availability of funds will have a huge impact on the quality and availability of human resources and any delay in securing training funds will have a serious impact on establishing programs to keep pace with technology. Planners must ensure adequate funds will be available to support the training plan and have alternative plans already developed in the event the funding status changes. Characteristically, the training budget is the first place budget cuts take place when resources are tight. Procuring more equipment at the expense of training is foolish and shortsighted and training administrators must vigorously defend their budgets and convince decision makers that the infrastructure cannot be sustained without properly trained technicians and controllers.

Developing a Financial Resource Plan

There are a number of international financial institutions that we have had contact with such as the ExIm Bank, European Bank for Reconstruction and Development, International Finance Corporation, World Bank and Overseas Private Investment Corporation that are available to support CAA expansion and modernization. As mentioned earlier, most lending institutions will require collateral. One possibility for securing a loan is the so called "user pays" concept or establishing user fees for ATC and FIR services. While this subject is a bit dicey in the US, it is clearly a viable revenue source for backing loans that should be considered by CAAs. The Eurocontrol member states, for example, already have a uniform policy that has been in place for many years for the collection of over flight fees that could serve as a model for other countries including the US. ICAO has published guidelines and user fee standards but only a handful of CAAs, mostly the ones that have privatized as mentioned earlier, have taken steps to establish a "fee for service" program. The benefits of establishing such programs are well worth the return on investment. CAAs would be able to depend on a consistent revenue stream, airlines would receive benefit from improved ATC services and safety and efficiency would be enhanced because ATC infrastructures would be upgraded, modernized and highly reliable.

Keep in mind that having the strategic plan, the financial resource plan and the training plan in order are paramount first steps that must be completed "before heading to the bank". In that regard, it may be prudent for the CAA to conduct a preliminary assessment study before putting the strategic and financial plans together. There are several experienced companies like ours that specialize in establishing strategic, financial and training plans by first performing a "needs analysis study". The analysis would determine what type of systems design, strategic and financial plan is needed based on their current air traffic and future growth forecasts.

Life Cycle

In the development of an ATC modernization strategic plan, each CAA must consider the long-term life cycle impact on training. They must determine whether it is better to develop a generic maintenance and training capability or outsource that function to private industry. Every CAA needs to conduct a thorough analysis of its in-house capabilities with a view toward its long-term objectives. For example, if one country's national priorities is to expand tourism and recreational markets they may need more airports and direct air routes in and out of the country from many different continents. To meet this objective may require substantial air navigation

infrastructure. In this event, it may be more cost effective to develop an in-house maintenance and training capability rather than contract out the service. A careful study with decision criteria and support tools such as state of the art simulation and modeling should be used to address this critical issue. The US (FAA) is experimenting with the idea of service providers for its network communication systems but as of today, has not considered outsourcing its maintenance and training requirements – it may in the future.

Political Stability

A country's political stability has an indirect impact upon training. Financial institutions will be wary of lending funds to governments with a track record of constant change and turmoil. Further they will want to be assured that once started, any change in government will honor its commitments and continue the program to completion. One way to convince a financial institution that a country is serious about modernization is to privatize aviation. A privatized civil aviation authority may be less likely to be affected by changes in the political scene. The privatized authority will be more interested in making a profit and therefore more likely to complete a project successfully than perhaps a government run institution will. This is happening in countries like South Africa with much success.

Security

Security has only recently come to the head of the line in the Air Traffic Modernization picture. Most administrations consider the air navigation infrastructure secure because it is usually located on government owned property. However, as we advance new technologies on public networks and outsource communications networks, security becomes an issue that must be addressed. We are cognizant of the direct terrorist threats such as bombing, and hijacking but we are not as savvy of the indirect threats such as IT intruders and hackers interrupting ATC communications or introducing bogus messages into data link systems. For example, while there are monitoring mechanisms to protect the aircraft from bogus data, the WAAS uplink is currently unprotected and is vulnerable to communications disruptions that could cause significant problems even deny the use of GPS for navigation. Accordingly, security training must not be overlooked and technicians and controllers must be taught how to cope with security breaches and threats.

CONCLUSIONS

The Boeing Company estimates that by the year 2015, the number of departures worldwide will jump from 15 million/day to over 30 million per day. The number of large transport category airplanes in service will leap from 12,600 to 26,000. Therefore, CAAs must get their training plans developed or updated now to prepare for the "new order".

A sound training strategy that includes both a training and financial plan is vital to the success of meeting the challenge that air traffic systems demand. Key elements of the strategy should address transition issues such as the life cycle, political and security and how to raise the financial support needed to implement the plan. The quality of the planning may directly determine the success of the CAAs ability to provide adequate training to meet the challenges of the future. Many of the issues I have presented are large in scope and will require considerable effort on the part of training administrators to find acceptable and workable solutions. The picture is bright however, and I am encouraged that governments around the world are realizing

that the future technology will bring great benefits and are taking the necessary steps to prepare for it.

References:

1. FAA Presentation at ATCA symposium entitled “International Considerations in Architecture” , May 11, 1999

2. Robert W. Poole, “For Safer, More Efficient Air Traffic Control”, Consumers’ Research Magazine, May 1998.

3. Robert W. Poole, Jr., “How to Spin Off Air Traffic Control”, Policy Study No. 166, Reason Foundation, August 1993.